**Summer circuit:**
Adding noise to the signal going from modem 1 to modem 2:

Rf = 250 Kohm

R1:R2: voltage divider to achieve +2.5 v

VDD: +5 v

Low pass filter

**Noise source:**
Radio with 15KHz Low Pass filter

So that both input signals see the same impedance
VDD: +5 v

Summer circuit

To modem 2

2.5 Kohm

Modem 1

Oscilloscope

Oscilloscope was used to confirm the measured RMS found using TRUE RMS DMM

Noise source:
Radio with 15KHz Low Pass filter

Using TRUE RMS DMM to measure noise Vrms,
Similarly, it was used to measure modem1 Signal Vrms

TRUE RMS DMM
- Modem 1: signal $V_{rms} = 31.3$ mV (when transmitting), 26mV otherwise.

- At noise $V_{rms} = 10$ mV, we get:
  \[ \text{SNR} = 10 \log(V_s^2/V_n^2) = 10 \text{ dB}. \]

- At higher noise (10 mV or more), the modems will NOT be able to communicate, transmit or receive.

- At lower noise (below 10 mV), the modems will always succeed in communicating, transmitting and receiving.

- We are aiming to operate around 15 dB SNR.